

Regulatory Regime Changes Under Federalism: Do States Matter More?

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The opinions and conclusions expressed are those of the authors and not the EPA.

Federal System

U.S. Environmental Policymaking

- EPA promulgates regulations and sets stringency**
- States implement and enforce regulations**
- States have considerable discretion**
 - writing air and water permits**
 - inspecting plants**
 - some state-specific rules and laws**

State discretion – Pros and Cons

Pros:

- States have flexibility in regulating => opportunities for innovative policies (50 experiments)**
- Increase net benefits from regulation
 - set $MB = MC$ in different locations****

State discretion – Pros and Cons (cont)

Cons:

- States free ride off neighbor's cleanup, allow border plants to pollute ($MC < MB$)**
- Sigman (2005)**
- Helland and Whitford (2003)**
- Gray and Shadbegian (2004)**
- “Race to the Bottom” – be lax, get jobs**
- “Race to the Top” – local harm, NIMBY**

Environmental Federalism

States differ in implementation and enforcement

- **Do stricter national regulations reduce state differences in effective regulatory stringency?**

Stricter national regulations could:

- **“raise the bar” forcing less stringent states to become more stringent**
- **give greater power to state regulators, enabling greater increases in stringency at more stringent states**

Paper Industry Background

Geographically diverse industry (21 states)

Technology differences: pulping type, non-pulping

Major source of water pollution (un-boatable rivers)

Air pollution - PM, SO₂, NO_x - power & recovery boilers

Toxics - dioxin (kraft pulping + chlorine bleaching)

Cluster Rule

First Integrated, Multimedia Regulation

- Targets reductions in toxic air and water releases from pulp and paper mills**
- Announced March 8, 1996**
- Promulgated April 18, 1998**
- Effective April 2001**
- Integrated to reduce regulatory burden**

Cluster Rule (cont)

- **Air Regulations**

Two MACT (Maximum Achievable Control Technology) Standards:

490 pulp and paper mills affected

1) more stringent for 155 mills using chemical pulping techniques

2) Less stringent for 335 mills using mechanical pulping techniques or purchased pulp

Cluster Rule (cont)

Goals for AIR Reductions:

59% - Hazardous Air Pollutants

47% - Sulfur

49% - VOCs

37% - PM

Cluster Rule (cont)

- **Water Regulations**

BAT (Best Available Technology Economically Achievable) Standard for reducing dioxin, furan, chloroform

- Impacts 96 of the 155 chemical pulping plants

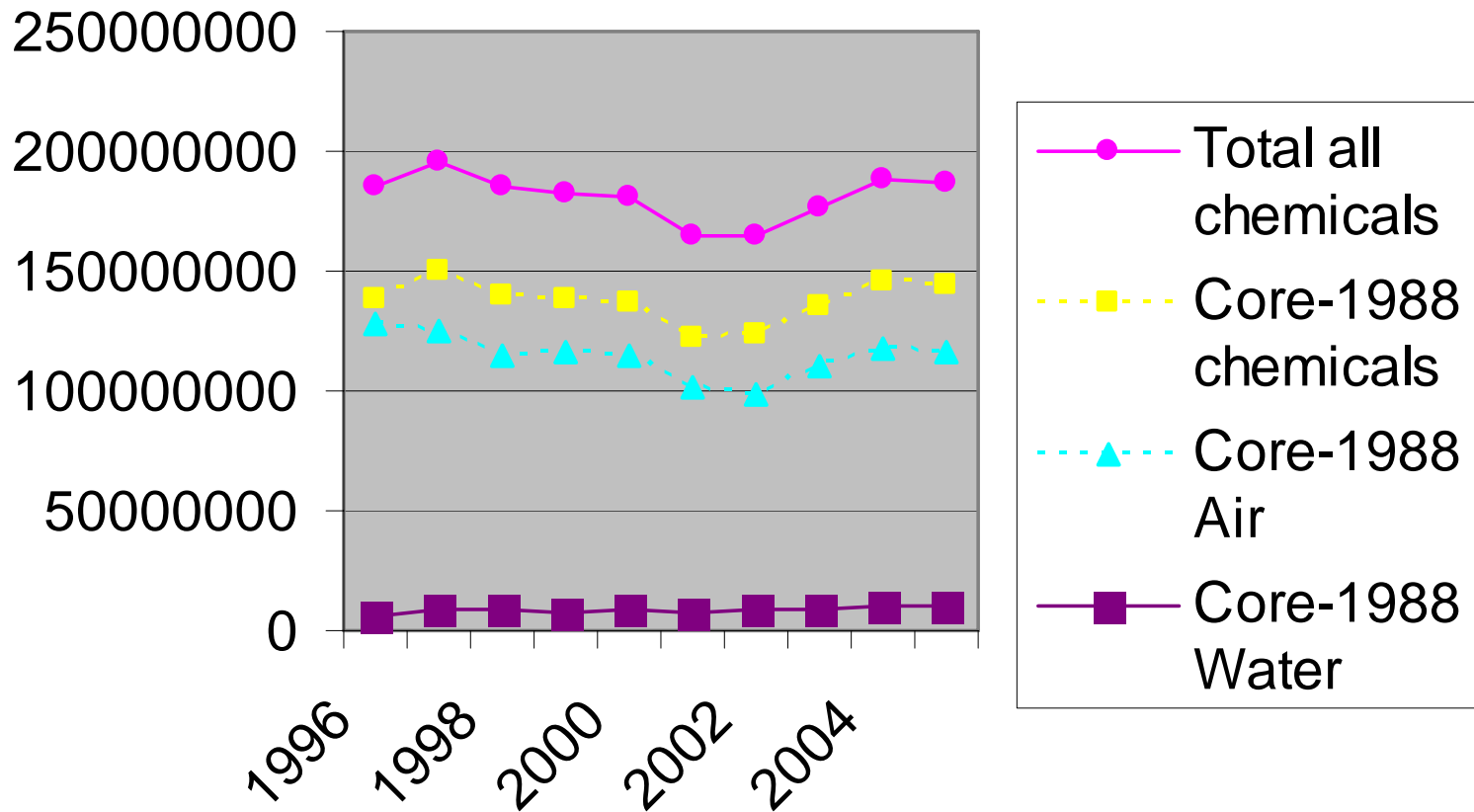
Cluster Rule (cont)

Goals for WATER Reductions

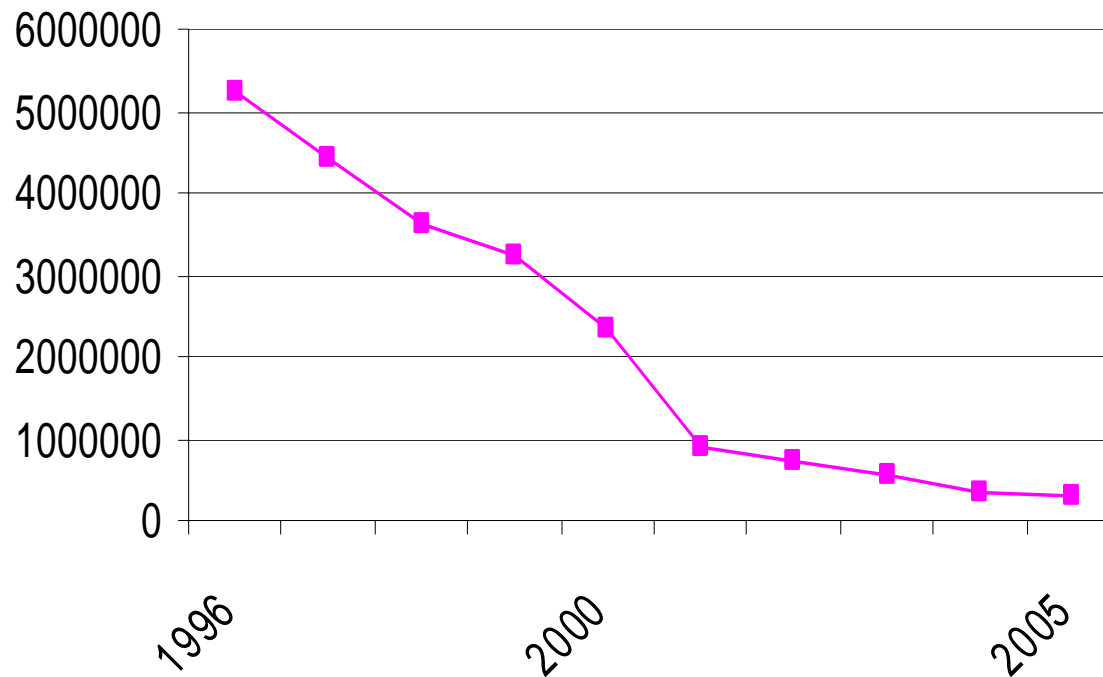
96% - Dioxin and Furan

99% - Chloroform

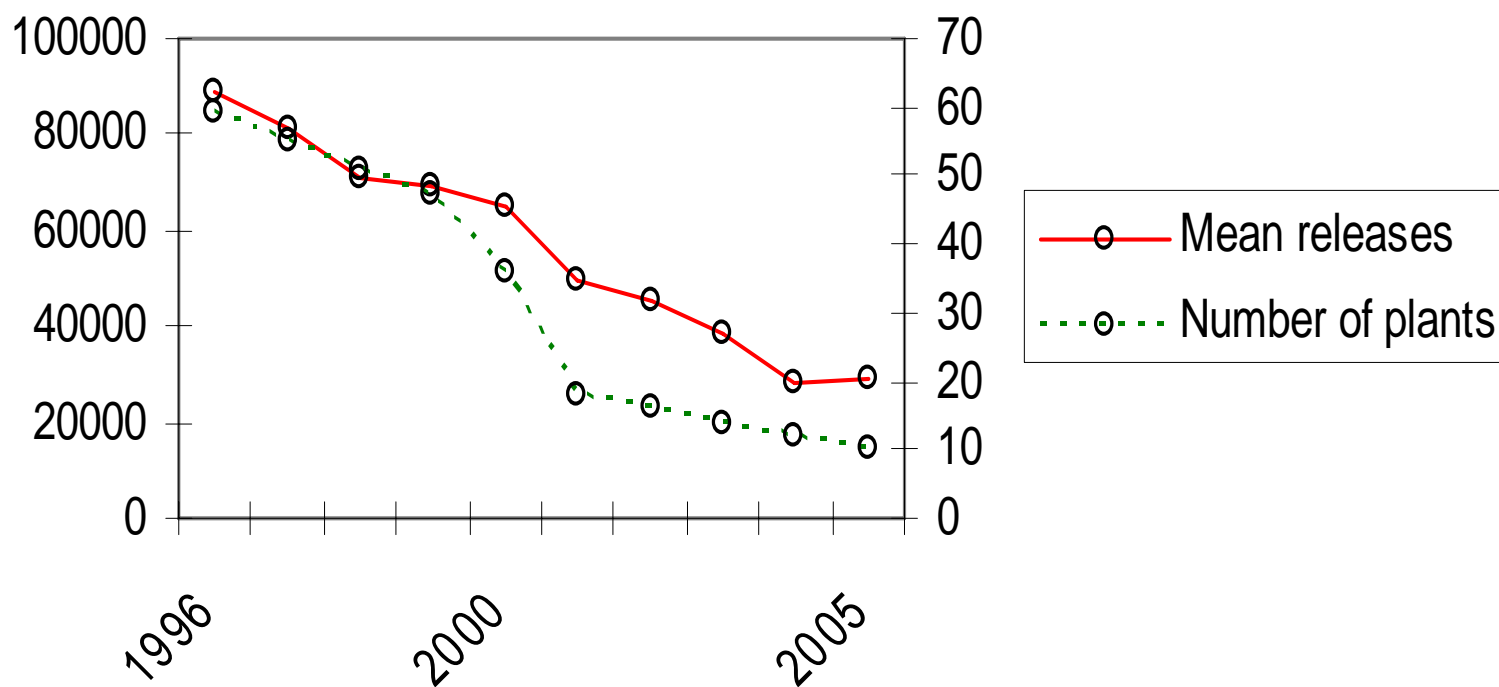
Toxic Releases, 1996-2005



Total Chloroform Releases, 1996-2005



Components of Chloroform Releases, 1996-2005



Literature Review

Environmental performance of polluting plants:

- **Conventional Air and Water pollutants:**

Magat and Viscusi (1990)

Gray and Deily (1996)

Laplante and Rilstone (1996)

Nadeau (1997)

Shadbegian and Gray (2003, 2006)

Earnhart (2004a, 2004b)

Shimshack and Ward (2005)

Gray and Shadbegian (2005, 2007)

Literature Review (cont)

- **Toxic Pollutants**

Khanna and Damon (1999)

Bui (2005)

Arora and Cason (1999)

Wolverton (2002)

Environmental Performance

$$Z_{pkt} = f_k(\text{CLUSTER}_{pkt}, \text{STATE}_{jt}, \text{CLUSTER}_{pkt} * \text{STATE}_{jt}, \\ X_{pt}, X_{ft}, \text{YEAR}_t, u_{pkt})$$

$Z_{pkt} \equiv$ environmental performance of plant p at time t for pollutant k (toxic and conventional air and water emissions)
higher Z = poorer performance

$\text{CLUSTER}_{pkt} \equiv$ Cluster Rule stringency (MACT, BAT) at plant p at time t along dimension k

$\text{STATE}_{jt} \equiv$ index of state regulatory stringency

$\text{CLUSTER} * \text{STATE}$ – test whether stricter states are differentially affected by the Cluster Rule

DATA

150 paper mills, 1996-2005 (105 MACT, 65 BAT)

TRI – Toxic - Total Releases, Air, Water, Chloroform

IDEA – Water – BOD and TSS

NEI (1996, 1999, 2002) – Air - PM10, SO2, VOCs

State Level Stringency – Green Vote

Lockwood Directory - Plant age, pulp & paper capacity

Technology – Kraft Pulping

Firm data – Compustat – Employment, Profits

Border Plant, Nonattainment, Poor, College Graduates

RESULTS

BASIC TRI MODEL

Ordinary Least Squares Regression

$\text{Log}(\text{Releases}) = f(\text{plant, firm, location, regulation, years})$

Regulation – overall stringency – GREEN VOTE

**Year Dummies – changes around time of cluster rule
possible anticipation, lagged effect**

BASIC TRI MODEL

(base year = 1996 = 0.000)

	AIR	WATER	Chloroform	TOTAL
1997	-0.035	0.412	-0.190	0.109
1998	-0.060	0.803*	-0.340	0.084
1999	-0.067	0.775*	-0.698	0.048
2000	-0.200	0.630	-1.419*	-0.027
2001	-0.424	0.722	-2.578*	-0.240
2002	-0.464	0.815*	-2.835*	-0.275
2003	-0.502*	0.996*	-2.982*	-0.303
2004	-0.419	1.103*	-3.139*	-0.223
2005	-0.488*	1.015*	-3.287*	-0.280

BASIC TRI MODEL

Probability of equality across years

	AIR	WATER	Chloroform	TOTAL
1996-2000	(.93)	(.22)	(.02)	(.94)
2001-2005	(.99)	(.86)	(.58)	(.99)
1996-2005	(.11)	(.20)	(.00)	(.09)
GREEN VOTE	-0.015*	-0.009	-0.024*	-0.010*
R-square	0.387	0.327	0.203	0.452

EXTENDED TRI MODEL

Same Plant, Firm, Location variables

Regulation – overall regulatory stringency – GREEN VOTE
Year Dummies – identify changes around time of cluster rule
(measures effects for least-stringent group)

MACT – 105 plants (subject to stricter air regulation)

BAT – 65 plants (subject to stricter water regulation)

Effective dates:

MACT - all 2001

BAT – some variation (water permit timing)

EXTENDED TRI MODEL

	AIR	WATER	Chloroform	TOTAL
MACT	1.585*		-0.632	1.334*
EFF-MACT	0.365		-0.596	0.350*
BAT		1.192*	3.823*	-0.016
EFF-BAT		-0.327	-3.390*	-0.097
GREEN VOTE	-0.009*	-0.008	-0.024*	-0.005

5-YEAR-CHANGE TRI MODEL

5-year growth: $\text{Log}(\text{TRI})_t - \text{Log}(\text{TRI})_{t-5}$

Comparing 2001-2005 with 1996-2000 (year by year)

Same Plant, Firm, Location variables

Year Dummies – changes within post-Cluster Rule period

Regulation variables

GREEN VOTE – state stringency

Effective MACT – plants subject to stricter air regulation

Effective BAT – plants subject to stricter water regulation

5-YEAR-CHANGE TRI MODELS

	AIR	WATER	Chloroform	TOTAL
EFF-MACT	0.376*		1.086*	0.213
EFF-BAT		-0.353	-4.510*	-0.040
GREEN VOTE	0.012*	0.001	0.011	0.010*

CONVENTIONAL POLLUTANTS

Provides comparison with TRI releases

Possible substitutes (within media or across media)

Possible complements (closed-loop process)

Regulation:

overall regulatory stringency – GREEN VOTE

Year Dummies – changes over time

MACT, BAT – Air, Water toxics stringency

EXTENDED CONVENTIONAL MODEL

	PM10	S02	VOCs	BOD	TSS
MACT	0.775*	0.202	0.656*		
EFF-MACT	-0.481	0.132	-0.520		
BAT				0.176	0.228*
EFF-BAT				0.139	0.098
GREEN VOTE	-0.018*	-0.023*	-0.020*	-0.016*	-0.011*

5-YEAR-CHANGE – CONVENTIONAL

	PM10	S02	VOCs	BOD	TSS
EFF-MACT	0.051	1.332*	0.056		
EFF-BAT				0.161	0.208
GREEN VOTE	0.010	0.031*	0.020	-0.001	-0.002

CONCLUSIONS

- **Control variables have (mostly) expected effects**
 - **Big, pulping plants emit more**
 - **More profitable emit less**
 - **Border plants emit more**
 - **Plants in poor neighborhoods emit more**
 - **Plants in college-educated neighborhoods emit less**
- **Regulatory stringency matters**
 - **Non-attainment – less air toxics, less particulates**
 - **GREEN VOTE – less air, water, chloroform, conventional**

CONCLUSIONS

- **Some Cluster Rule effects found**
 - **Reductions in air toxics around 2001**
 - **Very large reductions in chloroform, starting earlier**
 - **Effective-BAT plants (weakly) reduce water toxics**
 - **Effective-MACT plants (weakly) emit less PM10,VOC**
- **But...**
 - **Increases in water toxics overall**
 - **MACT plants increase air toxics around effective date**

CONCLUSIONS

- **Impact of state stringency**
 - **Plants in stringent states have smaller reductions**
 - **Answers question of paper: Do States Matter More?**
 - **No, States Matter Less**

Application to Decision-Making

- **Regulatory design, impact of stricter rules**
- **Focus on “federal” aspect of regulation**
- **Decision-maker = federal regulator**
- **Considering new rule to increase stringency**
 - **How much will plants reduce pollution?**
 - **How will impacts differ across plants?**
 - **What spillovers on other pollutants?**

Application to Decision-Making

- **Expect some pollution reduction?**
 - Yes, at least for some pollutants
- **Impacts differing across plants?**
 - Yes, depending on prior stringency
 - Less impact on plants in stricter states
 - Not closely connected to regulation-specific stringency
- **Spillovers to other pollutants?**
 - Not much observed here for conventional pollutants

Application to Decision-Making

- **Key points:**
 - **State regulatory stringency matters**
 - **Some plants already have low emissions**
- **Caveats**
 - **Results from single industry**
 - **Negative publicity = additional incentive**